(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) EP 0 535 826 B1

(12) EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention of the grant of the patent:
03.06.1998 Bulletin 1998/23

(51) Int. Cl.[6]: **B25B 23/04**, B25C 1/00

(21) Application number: **92308427.1**

(22) Date of filing: **16.09.1992**

(54) Fastener-driving tool assembly

Eintreibgerät für Befestigungsmittel

Outil d'enfoncement d'éléments de fixation

(84) Designated Contracting States:
AT BE CH DE ES FR GB IT LI NL SE

(30) Priority: **26.09.1991 US 765840**

(43) Date of publication of application:
07.04.1993 Bulletin 1993/14

(60) Divisional application:
97201263.7 / 0 790 103

(73) Proprietor:
ILLINOIS TOOL WORKS INC.
Glenview, Illinois 60025-5811 (US)

(72) Inventors:
- **Dewey, George G.**
PROSPECT HEIGHTS, ILLINOIS (US)
- **Allen, Ronald J.**
Geneva, Illinois (US)

(74) Representative:
Rackham, Stephen Neil et al
GILL JENNINGS & EVERY,
Broadgate House,
7 Eldon Street
London EC2M 7LH (GB)

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Remarks:
Divisional application 97201263.7 filed on 28/04/97.

EP 0 535 826 B1

Printed by Xerox (UK) Business Services
2.16.3/3.4

Description

This invention pertains to a tool assembly including a powder-actuated nail-driving tool.

Commonly, powder-actuated nail-driving tools are arranged to drive nails of a known type comprising a shank defining an axis and having a tip at one end, a head integral with the other end of the shank, and a washer carried by the shank with an interference fit. Such fasteners are exemplified in Almeras et al. U.S. Patent No. 4,824,003.

In such a fastener, the washer is carried near but in spaced relation to the tip and is moveable axially toward the head when the fastener is driven with the washer bearing against a workpiece. The head diameter and the washer diameter are approximately equal.

As exemplified in Almeras et al. U.S. Patent No. 4,824,003, it is known for such a tool to be muzzle-loaded with such fasteners, which are loaded one at a time. As exemplified in Pfister U.S. Patent No. 4,881,643, it is known to load a plurality of different fasteners into a powder-actuated tool, via a carrier strip fed laterally into the tool.

A common use of a powder-actuated tool, as exemplified in Almeras et al. U.S. Patent No. 4,824,003, is to attach metal decking members to steel structural members or concrete floors. For such a use, it would be highly desirable to adapt such a tool so as to facilitate its use by a standing worker. Neither a muzzle-loaded tool nor a strip-loaded tool would be entirely satisfactory, since the worker would have to lift the tool or to stoop whenever it was necessary to reload the tool.

US-A-3,760,485 discloses a threaded fastener feed and drive mechanism which is hand operated and manually positioned, where a threaded fastener is automatically fed through a magazine to be engaged by a rotating driver.

US-A-4,397,412 discloses a stand-up type tool for driving fasteners.

The tool assembly according to the present invention is defined in claim 1.

Preferably the tool assembly further comprises means for retaining the nail in the passageway when the shuttle is in the delivery position so as to prevent the nail from dropping accidentally but so as to permit the nail to be axially driven from the passageway by the driving means.

The invention facilitates the use of a nail-driving tool by a standing worker. There is no need for such a worker to lift the tool assembly or to stoop when it is desired to reload the fastener-driving tool with individual fasteners. Carrier strips are not used.

The present invention will now be described with reference to the accompanying drawings, in which:-

Figure 1 is a perspective view of a powder-actuated tool being used to drive fasteners through a metal decking member, into a concrete substrate, with a standing worker using the tool being shown in phantom lines;

Figure 2 is a fragmentary, perspective view of an upper portion of the tool;

Figure 3 is a fragmentary, enlarged perspective view of lower portions of the tool;

Figure 4 is a detail of part of Figure 3 with elements removed for clarity;

Figure 5 is a fragmentary, sectional detail taken along the line 5-5 shown Figure 3, in a direction indicated by the arrows;

Figure 6 is an enlarged fragmentary, side elevation of a nosepiece, a shuttle and associated components of the tool, as seen from the front of the tool with the shuttle in a retracted, fastener-receiving position;

Figure 7 is an end elevation of the same components, shown in Figure 6;

Figure 8 is an elevation similar to Figure 6 but taken with the shuttle in an advanced, fastener-delivery position;

Figure 9 is an elevation similar to Figure 7 but taken with the shuttle in the advanced position;

Figure 10 is a fragmentary, sectional view taken along the line 10-10 shown in Figure 6, in a direction indicated by the arrows;

Figure 11 is a fragmentary, sectional view taken along the line 11-11 shown in Figure 10, in a direction indicated by the arrows;

Figure 12 is a view similar to Figure 10 but taken with the shuttle in the advanced position;

Figure 13 is a view similar to Figure 11 but taken with the shuttle in the advanced position;

Figure 14 is a view similar to Figures 11 and 13 but showing a driving ram having driven a fastener partly through an aperture of the nosepiece;

Figure 15 is a view similar to Figures 11, 13, and 14 but taken to show the driving ram having driven the fastener through the workpiece, into the substrate, so as to fasten the workpiece onto the substrate;

Figure 16 is a view similar to Figures 11, 13, 14, and 15 but taken to show the driving ram being retracted and the shuttle having been retracted, the workpiece, the substrate, and the fastener fastening the workpiece onto the substrate are omitted;

Figure 17 is a view similar to Figure 11 but taken to show an inverted fastener having been guided into the shuttle;

Figure 18 is a view similar to Figure 17 but taken to show that the shuttle cannot be fully moved into the advanced position because of interference between the inverted fastener and other structure; and

Figure 19 is an embodiment of this invention.

As shown in Figures 1, 2, and 3, a portable, powder-actuated, fastener-driving tool assembly 10 constitutes a preferred embodiment of this invention. As described below, the tool assembly 10 has fastener-

loading features facilitating its use by a standing worker who does not have to lift the tool assembly 10 or to stoop when it is desired to reload the tool assembly 10 with individual fasteners.

One important, exemplary use of the tool assembly 10 is to successively drive fasteners through a metal workpiece, such as a metal decking member 12 shown in Figure 1, into a steel structural member (not shown) or into a concrete substrate, such as the concrete substrate 14 shown in Figure 1. The decking member 12 and the concrete substrate 14 are shown also in Figures 11, 13, 14, and 15.

As shown in Figures 10 to 18, the tool assembly 10 is designed to work advantageously with individual fasteners 20, which are not collated, of a type comprising a shank 22 defining an axis and having a tip 24 at one end, a head 26 integral with the other end of the shank 22, and a washer 28 carried by the shank 22 with an interference fit near but in spaced relation to the tip 24. For use with the preferred embodiment of this invention, each fastener 20 is made from a magnetizable metal, such as carbon steel. As mentioned above, such fasteners are exemplified in Almeras et al. US Patent No.4,824,003.

In such a fastener 20, the washer 28 is moveable axially toward the head 26 when the fastener 20 is driven with the washer 28 bearing against a workpiece, such as the decking member 12, as shown in Figure 15. Ordinarily, as shown in Figure 15, the washer 28 remains spaced axially from the head 26 after the fastener 20 has been driven. The head 26 defines a head diameter. The washer 28 defines a washer diameter, which is equal approximately to the head diameter.

The tool assembly 10 comprises a portable, powder-actuated, fastener-driving tool 30, which (except as modified for purposes of this invention) is available commercially, as Model P230, from Societe de Prospection et d'Inventions Techniques S.P.I.T. of Valence, France, a subsidiary of Illinois Tool Works Inc. of Glenview, Illinois. Various features of the tool 30 are disclosed in prior patents including Almeras et al. U.S. Patent No. 4,824,003 and Bosch U.S. Patent No. 4,375,269.

The tool 30 comprises a housing structure 32, which includes a pistol grip 34, and a nosepiece assembly 36. It is convenient to refer to the pistol grip 34, which is cut away for purposes of this invention, as a primary handle. The nosepiece assembly 36 is mounted to the housing structure 32, via a tubular element 38, so as to permit relative movement of the housing structure 32 and the nosepiece assembly 36, along an axis defined by the tubular element 38, between an extended condition and a retracted condition. A coiled spring 40 is disposed around the tubular member 38, between the housing structure 32 and the nosepiece assembly 36, so as to bias the housing structure 32 and the nosepiece assembly 36 toward the extended condition. The housing structure 32 and the nosepiece assembly 36 are shown in the extended condition in Figures 1, 3, 6, and 7 and in the retracted condition in Figures 8 and 9.

The tool 30 is arranged in a known manner to be manually actuated via a trigger 50, which is mounted operatively to the primary handle 34, so as to ignite an explosive charge in a cartridge (not shown) loaded into the tool 30. As disclosed in Bosch U.S. Patent No. 4,375,269, the tool 30 is arranged to be manually loaded with a magazine holding ten cartridges. Ignition of the explosive charge causes a driving ram 52 (see Figures 11 and 13 through 18) to be axially driven with an explosive force, which can drive a fastener, such as one of the fasteners 20, from the nosepiece assembly 36, through a metal workpiece, such as the metal decking member 12, into a concrete substrate, such as the concrete substrate 14.

The trigger 50 is arranged in a known manner so as to be normally deactuated and to be manually actuated when pulled in an inward direction relative to the primary handle 34, i.e., in an upward direction in Figures 1, 3, and 5. It is convenient to refer to the trigger 50 as a primary trigger. The tool 30 has internal mechanisms (not shown) known heretofore for preventing the tool 30 from being actuated via the primary trigger 50 unless the nosepiece assembly 36 is pressed against an unyielding object, such as the metal decking member 12 overlying the concrete substrate 14, with sufficient force to compress the coiled spring 40 and to cause relative movement of the housing structure 32 and the nosepiece assembly 36 from the extended condition into the retracted condition.

So as to facilitate its use by a standing worker, the tool assembly 10 comprises a tubular extension 54, a lower end of which is fixed to the housing structure 32, and an upper handle 58, which is fixed to an upper end of the tubular extension 54. A secondary trigger 60 is mounted operatively to the upper handle 58 so as to be pivotally moveable between an inoperative position and an operative position. The secondary trigger 60 is arranged to actuate the primary trigger 50 remotely when the secondary trigger 60 is pivoted from its inoperative position into its operative position.

As shown in Figures 3, 4, and 5, a remote actuator 62 is mounted operatively to the primary handle 34 via a bracket 64. The bracket 64 has two bracket arms 66, between which the remote actuator 62 is mounted pivotally via a pivot pin 68 for pivotal movement between an inoperative position and an operative position. The pivot pin 68 extends axially from one of the bracket arms 66. The remote actuator 62 is arranged to actuate the primary trigger 50, as suggested by a curved arrow in Figure 5, when the remote actuator 62 is pivoted from its inoperative position into its operative position.

The remote actuator 62 comprises a bracket 70 15 having two bracket arms 72 and a cross pin 74 extending between the bracket arms 72 and from one of the bracket arms 72. The cross pin 74 is threaded where the cross pin 74 extends therefrom. A torsional spring 78 is disposed around the pivot pin 68 where the pivot

pin 68 extends from one of the bracket arms 66. A bearing sleeve 76 is disposed around the cross pin 74, between the bracket arms 72, so as to permit the bearing sleeve 76 to rotate about the cross pin 74. The torsional spring 78 has a first arm 80 extending into a small hole in the same one of the bracket arms 66 and a second arm 82 bearing against the cross pin 74 where the cross pin 74 extends from one of the bracket arms 72. The second arm 82 is secured by a nut 84 threaded onto the cross pin 74 where the cross pin 74 is threaded. The torsional spring 78 biases the remote actuator 62 toward its inoperative position, in which the primary trigger 50 is not actuated.

A wire cable 86 and a flexible sleeve 88, through which the wire cable 86 is deployed so as to permit relative movement between the wire cable 86 and the flexible sleeve 88, are provided for the primary and secondary triggers. The flexible sleeve is made from a flexible, spiral-wound, metal ribbon, which has an outer, polymeric sheath. The wire cable 86 and the flexible sleeve 88 are deployed from the upper handle 58, through an upper portion of the tubular extension 54, and through an orifice 90 in the tubular extension 54. An upper end portion of the wire cable 86 is secured to the upper handle 58. A lower end portion of the wire cable 86 is secured to the remote actuator 62. The lower end portion of the wire cable 86 is secured to the cross pin 74, by the nut 84, where the cross pin 74. extends from one of the bracket arms 72. An upper end portion of the flexible sleeve 88 is disposed so as to coact with the secondary trigger 60 in such manner that the flexible sleeve 88 is pushed along the wire cable 86, away from the upper end portion of the wire cable 86, when the secondary trigger 60 is pivoted from its inoperative position into its operative position. A lower end portion of the flexible sleeve 88 is secured to the bracket 64. The bracket 64 has a bore (not shown) through which the lower end portion of the wire cable 86 extends.

When the flexible sleeve 88 is pushed along 25 the wire cable 86, away from the upper end portion of the wire cable 86, the wire cable 86 and the flexible sleeve 88 tend to bow outwardly, particularly but not exclusively between the orifice 90 and the bracket 64. Also, as the flexible sleeve 88 tends to be substantially incompressible, the lower end portion of the wire cable 86 is drawn upwardly into the flexible sleeve 88. Thus, when the secondary trigger 60 is actuated, i.e., pivoted from its inoperative position into its operative position, the remote actuator 62 is pivoted from its inoperative position into its operative position, the remote actuator 62 is pivoted from its inoperative position into its operative position, whereby the primary trigger 50 is actuated.

As shown in Figures 1, 2, 3, and 6, a flexible tube 100 is provided for guiding fasteners, such as the fasteners 20, successively into the nosepiece assembly 36. An upper end of the flexible tube 100 is stretched over an inlet tube 102 having a flared mouth 104, as shown in Figure 2, and is secured by a clamping band 106. A lower end of the flexible tube 100 is stretched over an outlet tube 108, as shown in Figure 6, and is secured by a clamping band 110. The inlet tube 102 is secured to the tubular extension 54, near the upper handle 58, by a bracket arm 112, which is clamped to the tubular extension 54. The outlet tube 108 is an element of the nosepiece assembly 36. The flexible tube 100, the inlet tube 102, and the outlet tube 108 are sized to permit fasteners, such as the fasteners 20, to be individually and successively dropped into the flared mouth 104 of the inlet tube 102, through the inlet tube 102, through the flexible tube 100, into the outlet tube 108, and through the outlet tube 108. Preferably, the flexible tube 100 is made from mesh-reinforced, polymeric tubing.

As discussed above, the tool 30 has internal mechanisms for preventing the tool 30 from being actuated unless the nosepiece assembly 36 is pressed against an unyielding object with sufficient force to compress the coiled spring 40 and to cause relative movement.of the housing structure 32 and the nosepiece assembly 36 from the extended condition into the retracted condition. When the nosepiece assembly 36 is moved from its extended position into its retracted position, the flexible tube 100 can flex as necessary, even if the flexible tube 100 is filled with fasteners, such as the fasteners 20.

The nosepiece assembly 36 comprises a nosepiece 120 having an aperture 122 extending vertically through the nosepiece 120. The aperture 122 defines an axis. The aperture 122 is arranged to permit a fastener 20 to be axially driven through the aperture 122 with the washer 28 preceding the head 26. The nosepiece 120 has a slot 124 extending transversely into the nosepiece 120, having an open face, and intersecting the aperture 122.

The nosepiece assembly 36 comprises a shuttle 130, which is block-like, as shown. The shuttle 130 is disposed in the slot 124 so as to be transversely moveable along the slot 124 relative to the nosepiece 120, between a retracted, fastener-receiving position and an advanced, fastener-delivery position. The shuttle 130 is shown in its retracted position in Figures 6, 10, and 11, and in its advanced position in Figures 8, 11, 12, and 13.

A linkage 140, which comprises a first link 142 and a second link 144, interconnects the nosepiece 120 and the shuttle 130 at the open face of the slot 124 One end of the first link 142 is connected pivotally to the nosepiece 120 via a pivot pin 146. The other end of the first link 142 is connected pivotally to one end of the second link 144 via a pivot pin 148. The other end of the second link 144 is connected pivotally to the shuttle 130 via a pivot pin 150.

A torsion spring 160 is deployed around the pivot pin 146, between the first link 142 and the nosepiece 120. One arm 162 of the torsion spring 160 extends into a small hole in the nosepiece 120 so as to fix the arm

162 relative to the nosepiece 120. The other arm 166 of the torsion spring 160 extends into a small hole in the first link 142 so as to fix such arm 166 relative to the first link 142. The torsion spring 160 is wound so as to bias the first link 142 in one rotational sense (clock-wise in Figures 6 and 8) whereby the shuttle 130 is biased toward its retracted position. The torsion spring 160 permits the shuttle 130 to move toward its advanced position.

As shown in Figures 6 through 9, a camming element 170 is attached to the housing structure 32 so as to extend downwardly from the housing structure 32. The camming element 170 has a camming surface 172 at the lower end. The camming element 170 is arranged so that the camming surface 172 engages a camming surface 176 of the first link 142, when the nosepiece assembly 36 is pressed against an unyielding object with sufficient force to compress the coiled spring 40, so as to pivot the first link 142 on the pivot pin 146. Upon relative movement of the housing structure and the nosepiece assembly 36 from the extended condition into the retracted condition, the camming element 170 moves the linkage 140, which overcomes the torsion spring 160 and moves the shuttle 130 from its retracted position into its advanced position.

The shuttle 130 has a passageway 180 extending vertically through the shuttle 130 and a slot 182 extending transversely from an inner end of the shuttle 130 and intersecting the passageway 180. The passageway 180 is arranged to receive a fastener 20 with the washer 28 preceding the head 26, and with the fastener 20 disposed axially in the passageway 180, and to permit the fastener 20 to be axially driven through the passageway 180. The shuttle 130 defines a cylindrical wall 184 surrounding the passageway 180 except where the slot 182 intersects the passageway 180. The width of the slot 182 is less than the diameter of the cylindrical wall 184, less than the head and washer diameters of the fastener 20, but more than the diameter of the driving ram 52, which is cylindrical except for a frusto-conical tip 186. Thus, as shown in Figure 10, the cylindrical wall 184 is configured to surround the fastener 20 in the passageway 180 except for the slot 182.

As shown in Figures 10 through 18, the shuttle 130 has a wedge-shaped, camming groove 188, which is inclined backwardly and upwardly from an upper, front edge of the shuttle 130. When a fastener 20 is received fully by the passageway 180 with the shuttle 130 in the retracted position, the tip 24 of the next fastener 20 extends slightly into the passageway 180 so as to bear on the head 26 of the underlying fastener 20. Thereupon, when the shuttle 130 is moved toward the advanced position, the tip 24 bearing thereon is cammed upwardly by the wedge-shaped surfaces of the groove 188 so as no to interfere with the moving shuttle 130.

A permanent magnet 190 is mounted fixedly in a slot 192 in the nosepiece 120. The magnet 190 is mounted so as to extend through the slot 182 in the shuttle 130, into the inner end of the slot 124, and so as to engage the head 26 of a fastener 20 in the passageway 180, when the shuttle 130 is in the advanced position. Because the fastener 20 is made from a magnetizable metal, the magnet 190 retains the fastener 20 in a pre-driving position in the passageway 180 when the shuttle 130 is in the advanced position so as to prevent the fastener 20 from dropping accidentally, but so as to permit the fastener 20 be axially driven through the aperture 122 by the driving ram 52.

Because the width of the slot 182 in the shuttle 130 is less than the head and washer diameters of the fastener 20, the shuttle 130 is arranged to retract the fastener 20 at such time as the shuttle 130 is retracted, if there is a failure of ignition when the tool 30 is actuated with the shuttle 130 in the advanced position. There may be a failure of ignition simply because a worker using the tool 30 has failed to notice that all cartridges in a magazine loaded into the tool 30 have been spent.

Because the width of the slot 182 in the shuttle 130 is more than the diameter of the driving ram 52, the slot 182 provides sufficient clearance for the driving ram 52 to permit the shuttle 130 to move from the advanced position (see, e.g., Figure 15) toward the retracted position (see, e.g., Figure 16) even if the driving ram 52 extends into or through the passageway 180. Therefore, after the tool 30 has been used to drive a fastener 20, it is not necessary to wait for the driving ram 52 to retract before lifting the tool 10.

The nosepiece 120 has an elongate groove 200 extending along the lower wall of the slot 124 for the shuttle 130 and intersecting the aperture 122. If a fastener 20 is disposed properly when dropped through the outlet tube 108, the groove 200 receives the tip 24 and the washer 28 engages the bottom of the slot 124, as shown in Figure 11.

Provision is made to prevent an inverted fastener 20 from being driven by the tool 10. If a fastener 20 is inverted when dropped through the outlet tube 108, the tip 24 extends upwardly and the head 26 engages the nosepiece 120 at the margins 202, 204, of the groove 200, as shown in Figure 17. A lower portion 206 of the outlet tube 108 is disposed to engage the tip 24, as shown in Figure 18, so as to prevent movement of the fastener 20 and the shuttle 130 into the advanced position.

As shown in Figure 19, in which similar elements are numbered similarly, an alternative embodiment of this invention is useful whether or not the fasteners 20 are made from a magnetizable material. A permanent magnet is not used. A shuttle 210 is used which is similar to the shuttle 130 except that the shuttle 210 has a hollow portion 212 with an inclined wall 214 facing downwardly and backwardly, i.e., downwardly and away from the aperture 122 of the nosepiece 120. A torsion spring 220 is mounted to the shuttle 210 in the hollow portion 212, and is deployed around the pivot pin 146

connecting the first link (not shown in Figure 19) to the shuttle 210. One arm 222 of the torsion spring 220 extends upwardly and backwardly and bears against the inclines wall 214. The other arm 224 of the torsion spring 220 extends oppositely and engages a fastener 20, when the fastener 20 is in the passageway 180 of the shuttle 210, so as to hold the fastener 20. Thus, as shown in Figure 19, the spring arm 224 engages the washer 28 and extends partly beneath the washer 28. Thus, the spring arm 224 prevents the fastener 20 from dropping when the shuttle 210 is in the advanced position but permits the fastener 20 to be axially driven through the aperture 122, by the driving ram 52.

Claims

1. A tool assembly (10) comprising a powder actuated nail-driving tool arranged to drive a nail (20) of a type comprising a shank (22) defining an axis and having a tip (24) at one end, and a head (26) integral with the other end of the shank; the tool assembly comprising:

   (a) a nosepiece (36) having an aperture (122) arranged to permit the nail (20) to be axially driven through it; and
   (b) driving means including a driving element (42) for engaging the head (26) so as to drive the nail (20) through the aperture (122); characterised by:
   (c) a shuttle (130, 210) moveable relative to the nosepiece (36) between a nail-receiving position and a nail-delivery position, the shuttle (130) having a passageway (180) arranged to receive the nail (22) with the nail (22) disposed axially in the passageway (180) and to permit the nail (22) to be axially driven through the passageway (180);
   (d) means (100, 108) for guiding the nail (22) axially into the passageway (180) when the shuttle (130) is in the receiving position; and
   (e) means (140) for moving the shuttle (130) from the receiving position into the delivery position with the nail (20) disposed axially in the passageway (180) when the nail (20) is to be axially driven through the passageway; wherein the driving element (42), is arranged to be driven axially through the passageway (180) when the shuttle (130, 210) is in the delivery position, for engaging the head (26) so as to drive the nail (20) axially from the passageway (180, 364), through the aperture (122),

   wherein the means for guiding a nail (20) comprises a flexible tube (100) for guiding the nail (200) axially into the passageway (180) when the shuttle (130, 210) is in the receiving position, and wherein the tool assembly further comprises a handle subassembly (30) spaced from said nosepiece (36) and means (140) for causing relative movement between the nosepiece (36) and the handle sub-assembly (30), resultant flexure of the flexible tube, and resultant movement of the shuttle (130, 210) from the receiving position into the delivery position with the nail (20) disposed axially in the passageway (180) when the nail (20) is to be axially driven through it, and wherein the handle sub-assembly comprises the combination of a primary handle (30), a secondary handle (58), and means (54) for connecting the primary (30) and secondary (58) handles in fixed, spaced relation to each other, wherein the combination comprises means comprising a primary trigger (55) mounted operatively to the primary handle (30) for actuating the tool, and means comprising a secondary trigger (60) mounted operatively to the secondary handle (58) for actuating the primary trigger (55) remotely and thereby enable an operator to actuate the driving means to drive nails into a workpiece from a position standing on the workpiece.

2. A tool assembly according to claim 1, further comprising means (190, 224, 370) for retaining the nail (20) in the passageway (180) when the shuttle (130, 210) is in the delivery position so as to prevent the nail (20) from dropping accidentally but so as to permit the nail (20) to be axially driven from the passageway (180) by the driving means (52).

3. A tool assembly according to claim 2, wherein the retaining means comprises a magnet (190), which is mounted so as to engage the nail (20) in the passageway (180) when the shuttle (130) is in the delivery position, whereby the nail (20) is held releasably by the magnet (190) if the nail is made of a magnetizable material.

4. A tool assembly according to claim 2, wherein the retaining means comprises a spring (224), which is mounted on the shuttle (210) and so as to engage the nail (20) when the nail (20) is in the passageway (180), whereby the nail (20) is held by the spring (224) even when the shuttle (210) is in the delivery position.

5. A tool assembly according to any one of the preceding claims, wherein the shuttle (130, 210) defines a wall of the passageway (180) and has a slot (182), the wall being configured so as to surround a nail (20) in the passageway (180) except for the slot (182), which provides sufficient clearance for the driving element (52) to permit the shuttle (130, 210) to move from the delivery position toward the receiving position even if the driving element (52) extends into our through the passageway

(180).

6. A tool assembly according to any one of the preceding claims, wherein an elongate groove (200) is defined in the bottom of the passageway (180) to receive the tip (24) of the nail (20) and to accommodate it as the shuttle (130, 210) moves from the receiving position into the delivery position and wherein the nosepiece (36) comprises means (206) for engaging the tip (24) of the nail (20) to limit movement of the nail (20) and the shuttle (130, 210) from the receiving position if the nail (20) is disposed upside down in the passageway (180).

Patentansprüche

1. Werkzeuganordnung (10) mit einem durch Zündpulver betätigten Nagel-Treibwerkzeug, das so ausgelegt ist, daß es einen Nagel (20) mit einem Schaft (22), der eine Achse definiert und an einem Ende eine Spitze (24) aufweist und mit dessen anderem Ende ein Kopf (26) integral ausgebildet ist, eintreibt, mit:

   (a) einem Nasenstück (36) mit einer Öffnung (122), die so angeordnet ist, daß der Nagel (20) axial durch diese getrieben werden kann; und

   (b) Treibmitteln mit einem Treibelement (42) zum Eingriff mit dem Kopf (26) in der Weise, daß der Nagel (20) durch die Öffnung (122) getrieben wird; gekennzeichnet durch:

   (c) einen Schlitten (130, 210), der relativ zu dem Nasenstück (36) zwischen einer einen Nagel aufnehmenden Position und einer einen Nagel abgebenden' Position beweglich ist, wobei der Schlitten (130) einen Durchgang (180) aufweist, der so angeordnet ist, daß er den Nagel (22) in einer axial in dem Durchgang (180) angeordneten Stellung aufnimmt und ermöglicht, daß der Nagel (22) axial durch den Durchgang (180) getrieben wird;

   (d) Mittel (100, 108) zum axialen Führen des Nagels (22) in den Durchgang (180), wenn sich der Schlitten (130) in der Aufnahmeposition befindet; und

   (e) Mittel (140) zum Bewegen des Schlittens (130) von der Aufnahmeposition in die Abgabeposition mit einem axial in dem Durchgang (180) angeordneten Nagel (20), wenn der Nagel (20) axial durch den Durchgang getrieben werden soll;

   wobei das Treibelement (42) so angeordnet ist, daß es axial durch den Durchgang (180) getrieben wird, wenn sich der Schlitten (130, 210) in der Abgabeposition befindet, zum Eingriff mit dem Kopf (26) in der Weise, daß der Nagel (20) axial von dem Durchgang (180, 364) durch die Öffnung (122) getrieben wird; und

   wobei das Mittel zum Führen eines Nagels (20) einen flexiblen Schlauch (100) umfaßt, um den Nagel (200) axial in den Durchgang (180) zu führen, wenn sich der Schlitten (130, 210) in der Aufnahmeposition befindet, wobei die Werkzeuganordnung ferner eine Handgriffuntergruppe (30), die von dem Nasenstück (36) beabstandet ist, und Mittel (140) aufweist, um eine relative Bewegung zwischen dem Nasenstück (36) und der Handgriffuntergruppe (30) zu bewirken, die eine Biegung des flexiblen Schlauches sowie eine Bewegung des Schlittens (130, 210) von der Aufnahmeposition in die Abgabeposition zur Folge hat, wobei der Nagel (20) axial in dem Durchgang (180) angeordnet ist, wenn der Nagel (20) axial durch diesen zu treiben ist, und wobei die Handgriffuntergruppe eine Kombination aus einem primären Handgriff (30), einem sekundären Handgriff (58) und Mitteln (54) zum Verbinden des primären Handgriffs (30) mit dem sekundären Handgriff (58) in einer festen, beabstandeten Relation zueinander umfaßt, wobei die Kombination Mittel, die einen wirksam an dem primären Handgriff (30) montierten primären Auslöser (55) zum Betätigen des Werkzeugs umfassen, sowie Mittel aufweist, die einen wirksam an dem sekundären Handgriff montierten sekundären Auslöser (60) zum entfernten Betätigen des primären Auslösers (55) umfassen und es dadurch einem Benutzer ermöglichen, das Treibmittel zum Eintreiben von Nägeln in ein Werkstück aus einer auf dem Werkstück stehenden Position zu betätigen.

2. Werkzeuganordnung nach Anspruch 1, mit Mitteln (190, 224, 370) zum Halten des Nagels (20) in dem Durchgang (180), wenn sich der Schlitten (130, 210) in der Abgabeposition befindet, um zu verhindern, daß der Nagel (20) unbeabsichtigt herausfallt, jedoch in der Weise, daß mit dem Treibmittel (52) ein axiales Treiben des Nagels (20) aus dem Durchgang (180) möglich ist.

3. Werkzeuganordnung nach Anspruch 2, bei der das Haltemittel einen Magnet (190) aufweist, der so montiert ist, daß er mit dem Nagel (20) in dem Durchgang (180) eingreift, wenn sich der Schlitten (130) in der Abgabeposition befindet, so daß der Nagel (20) lösbar von dem Magneten (190) gehalten wird, wenn er aus einem magnetisierbaren

Material hergestellt ist.

4. Werkzeuganordnung nach Anspruch 2, bei der das Haltemittel eine Feder (224) aufweist, die in der Weise an dem Schlitten (210) montiert ist, daß sie mit dem Nagel (20) eingreift, wenn sich der Nagel (20) in dem Durchgang (180) befindet, so daß der Nagel (20) durch die Feder (224) auch dann gehalten wird, wenn sich der Schlitten (210) in der Abgabeposition befindet.

5. Werkzeuganordnung nach einem der vorhergehenden Ansprüche, bei der der Schlitten (130, 210) eine Wand des Durchgangs (180) abgrenzt und einen Schlitz (182) aufweist, wobei die Wand so konfiguriert ist, daß sie einen Nagel (20) in dem Durchgang (180) mit Ausnahme des Schlitzes (182) umgibt, der einen ausreichenden Abstand für das Treibelement (52) schafft, um eine Bewegung des Schlittens (130, 210) von der Abgabeposition in Richtung auf die Aufnahmeposition auch dann zu ermöglichen, wenn sich das Treibelement (52) in oder durch den Durchgang (180) erstreckt.

6. Werkzeuganordnung nach einem der vorhergehenden Ansprüche, bei der in dem Boden des Durchgangs (180) eine verlängerte Nut (200) abgegrenzt ist, um die Spitze (24) des Nagels (20) aufzunehmen und für diese Platz zu bieten, wenn sich der Schlitten (130, 210) von der Aufnahmeposition in die Abgabeposition bewegt, und bei der das Nasenstuck (36) Mittel (206) zum Eingriff mit der Spitze (24) des Nagels (20) aufweist, um die Bewegung des Nagels (20) und des Schlittens (130, 210) aus der Aufnahmeposition zu begrenzen, wenn der Nagel (20) mit der Oberseite nach unten in dem Durchgang (180) liegt.

Revendications

1. Ensemble d'outil (10) comprenant une cloueuse actionnée par poudre agencée pour entraîner un clou (20) d'un type comprenant une tige (22) définissant un axe et présentant une pointe (24) à une extrémité, et une tête (26) monobloc avec l'autre extrémité de la tige; l'ensemble d'outil comprenant:

   (a) un nez (36) présentant un orifice (122) agencé pour permettre au clou (20) d'être entraîné axialement à travers lui; et
   (b) un moyen d'entraînement comprenant un élément d'entraînement (42) destiné à venir au contact de la tête (26) afin d'entraîner le clou (20) à travers l'orifice (122);
   caractérisé par:
   (c) une navette (130, 210) mobile par rapport au nez (36) entre une position de réception de clou et une position de distribution de clou, la navette (130) présentant un passage (180) agencé pour recevoir le clou (20), le clou (20) étant placé axialement dans le passage (180), et pour permettre au clou (20) d'être entraîné axialement à travers le passage (180);
   (d) un moyen (100, 108) pour guider le clou (20) axialement dans le passage (180) lorsque la navette (130) est dans la position de réception; et
   (e) un moyen (140) pour déplacer la navette (130) de la position de réception à la position de distribution, avec le clou (20) placé axialement dans le passage (180), lorsque le clou (20) doit être entraîné axialement à travers le passage;
   dans lequel l'élément d'entraînement (42) est agencé pour être entraîné axialement à travers le passage (180) lorsque la navette (130, 210) est dans la position de distribution, pour venir au contact de la tête (26) afin d'entraîner le clou (20) axialement hors du passage (180, 364) par l'orifice (122);
   dans lequel le moyen pour guider un clou (20) comprend un tube flexible (100) destiné à guider le clou (20) axialement dans le passage (180) lorsque la navette (130, 210) est dans la position de réception, et dans lequel l'ensemble d'outil comprend en outre un sous-ensemble de poignée (30) espacé dudit nez (36) et un moyen (140) pour provoquer un mouvement relatif entre le nez (36) et le sous-ensemble de poignée (30), qui entraîne une flexion du tube flexible et un mouvement de la navette (130, 210) de la position de réception à la position de distribution, avec le clou (20) placé axialement dans le passage (180), lorsque le clou (20) doit être entraîné axialement à travers lui, et dans lequel le sous-ensemble de poignée comprend la combinaison d'une poignée principale (30), d'une poignée secondaire (58) et d'un moyen (54) pour raccorder les poignées principale (30) et secondaire (58) de manière à être fixes et espacées l'une de l'autre, dans lequel la combinaison comprend un moyen qui comprend une gâchette principale (55) montée de façon opérante sur la poignée principale (30) pour actionner l'outil, et un moyen qui comprend une gâchette secondaire (60) montée de façon opérante sur la poignée secondaire (58) pour actionner à distance la gâchette principale (55) et permettre ainsi à un opérateur d'actionner le moyen d'entraînement pour enfoncer des clous dans une pièce de travail à partir d'une position debout sur la pièce de travail.

2. Ensemble d'outil selon la revendication 1, qui comprend en outre un moyen (190, 224, 370) pour rete-

nir le clou (20) dans le passage (180) lorsque la navette (130, 210) est dans la position de distribution, afin d'empêcher le clou (20) de chuter accidentellement mais de permettre au clou (20) d'être entraîné axialement hors du passage (180) par le moyen d'entraînement (52).

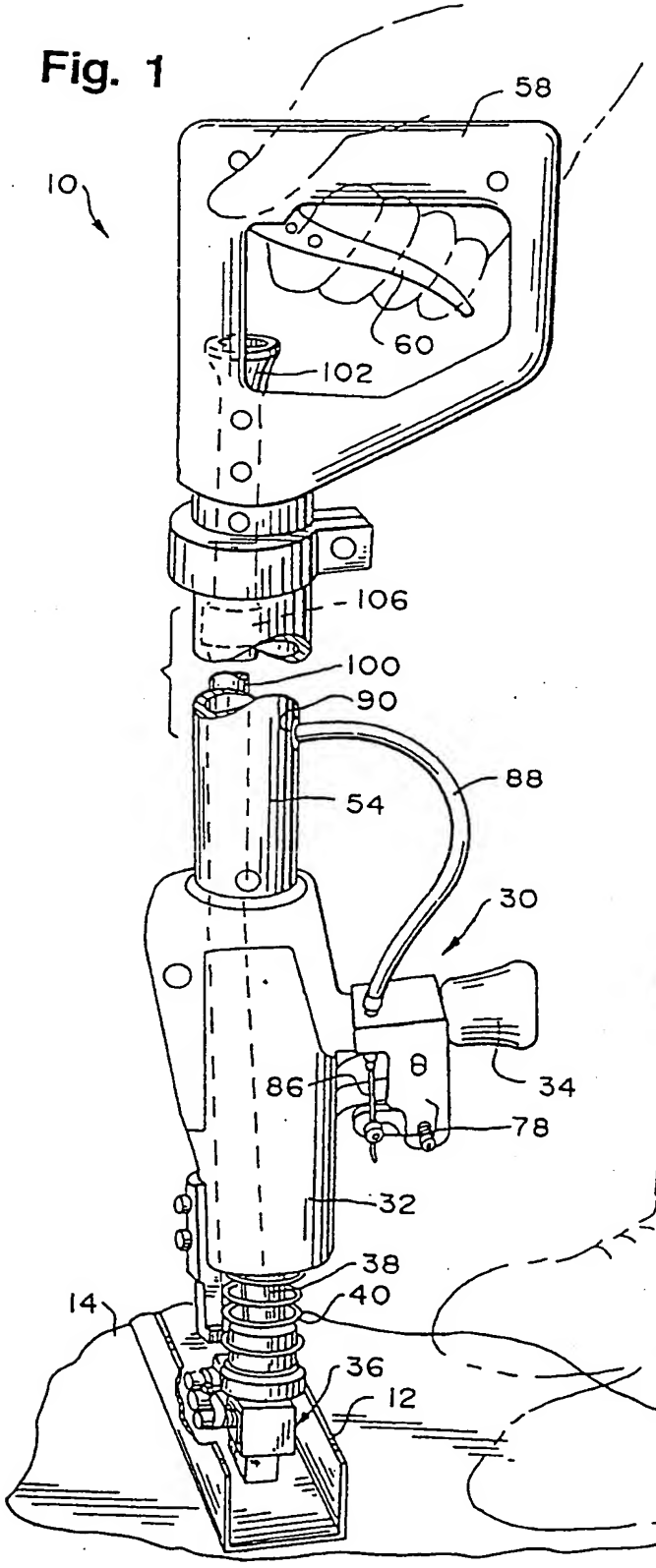
3. Ensemble d'outil selon la revendication 2, dans lequel le moyen de retenue comprend un aimant (190), qui est monté de façon à être au contact du clou (20) dans le passage (180) lorsque la navette (130) est dans la position de distribution, ce par quoi le chou (20) est retenu de façon libérable par l'aimant (190) si le clou est fait en un matériau magnétisable.

4. Ensemble d'outil selon la revendication 2, dans lequel le moyen de retenue comprend un ressort (224), qui est monté sur la navette (210) de façon à être au contact du clou (20) lorsque le clou (20) est dans le passage (180), ce par quoi le chou (20) est retenu par le ressort (224) même lorsque la navette (210) est dans la position de distribution.

5. Ensemble d'outil selon l'une quelconque des revendications précédentes, dans lequel la navette (130, 210) définit une paroi du passage (180) et présente une fente (182), la paroi étant configurée de manière à entourer un chou (20) dans le passage (180) sauf au niveau de la fente (182), qui fournit un dégagement suffisant à l'élément d'entraînement (52) pour permettre à la navette (130, 210) de se déplacer de la position de distribution vers la position de réception même si l'élément d'entraînement (52) s'étend dans ou à travers le passage (180).

6. Ensemble d'outil selon l'une quelconque des revendications précédentes, dans lequel une rainure allongée (200) est définie dans le fond du passage (180) pour recevoir la pointe (24) du clou (20) et pour la contenir lorsque la navette (130, 210) se déplace de la position de réception vers la position de distribution, et dans lequel le nez (36) comprend un moyen (206) pour venir au contact de la pointe (24) du clou (20) afin de limiter tout déplacement du clou (20) et de la navette (130, 210) à partir de la position de réception si le clou (20) est placé à l'envers dans le passage (180).

Fig. 1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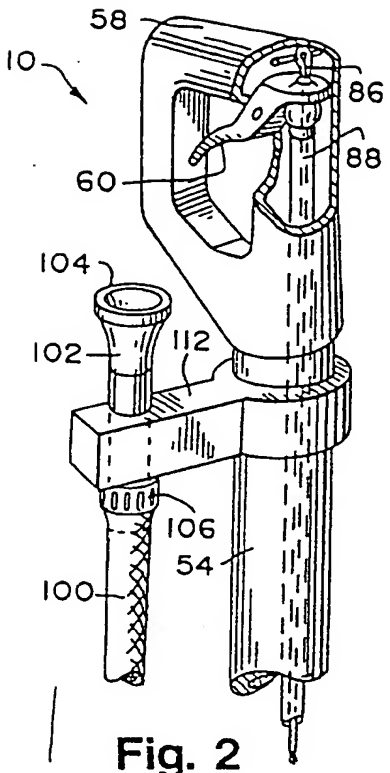
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Fig. 2

Fig. 3

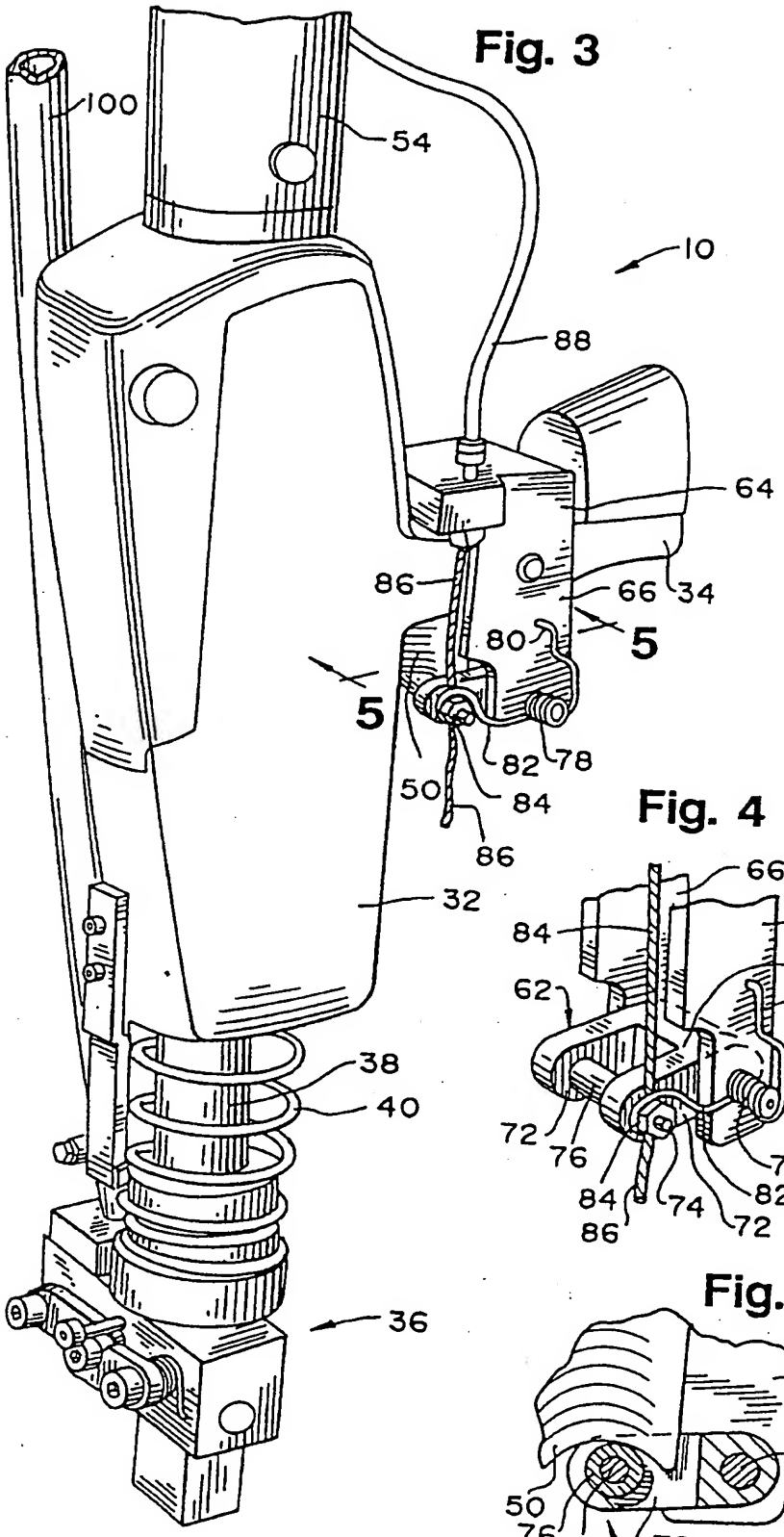


Fig. 4

Fig. 5

Fig. 6

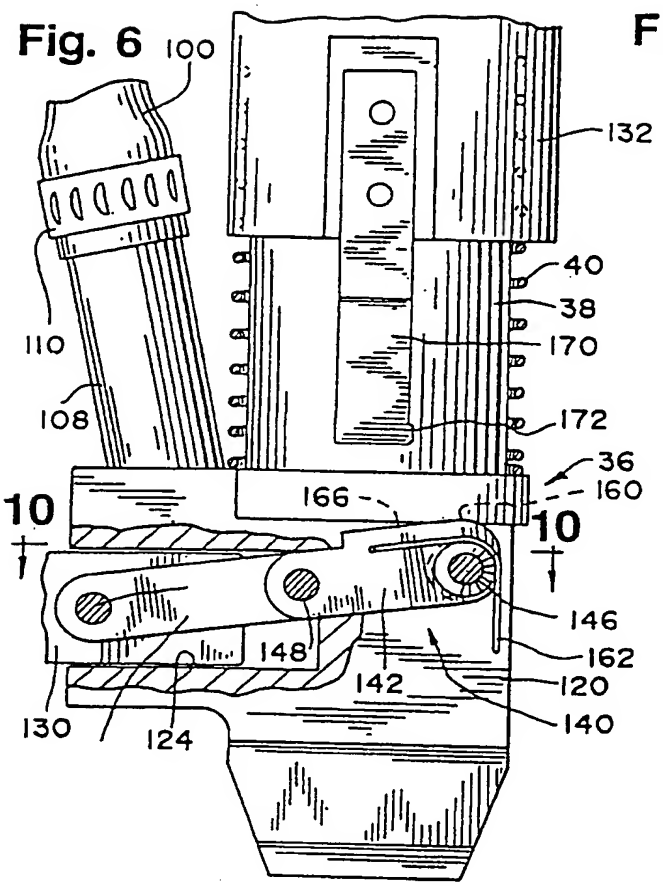


Fig. 7

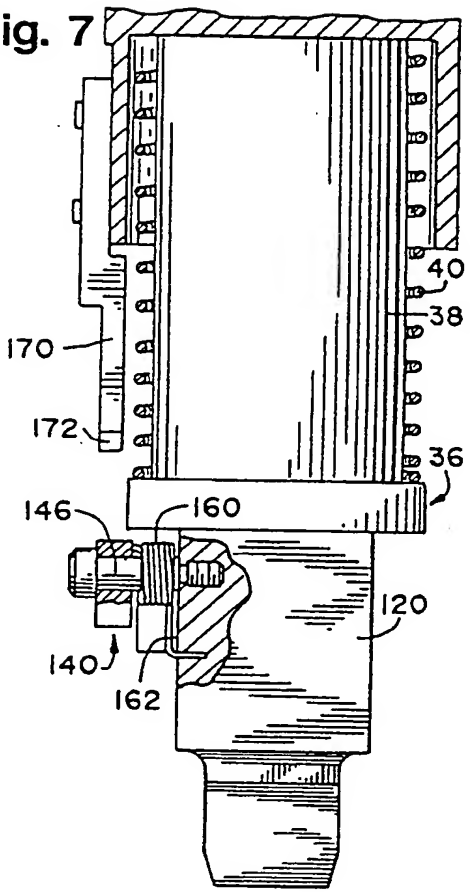


Fig. 8

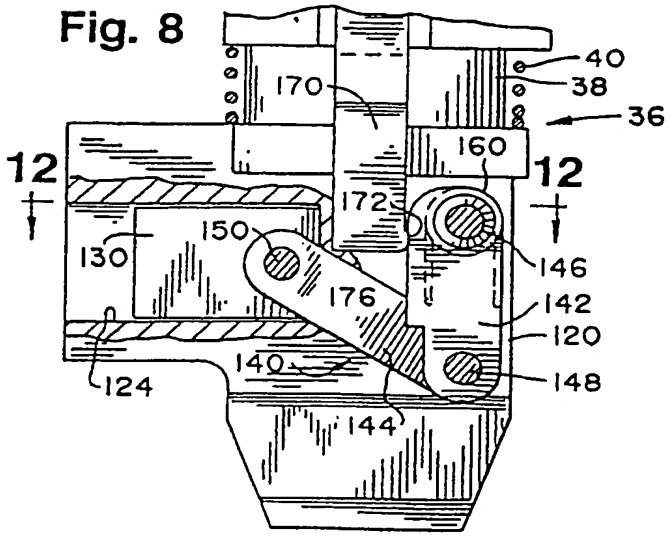


Fig. 9

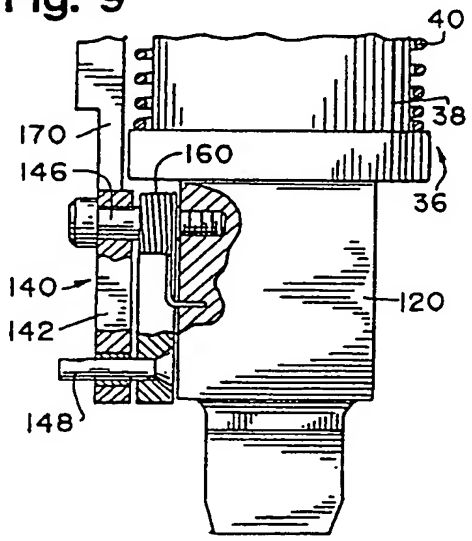
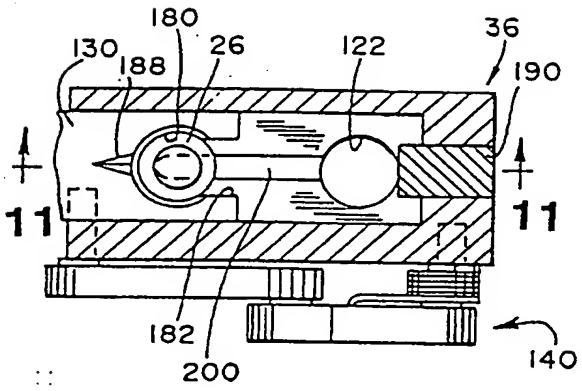


Fig. 10



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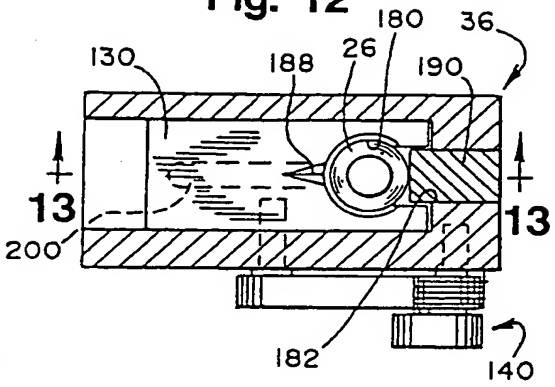

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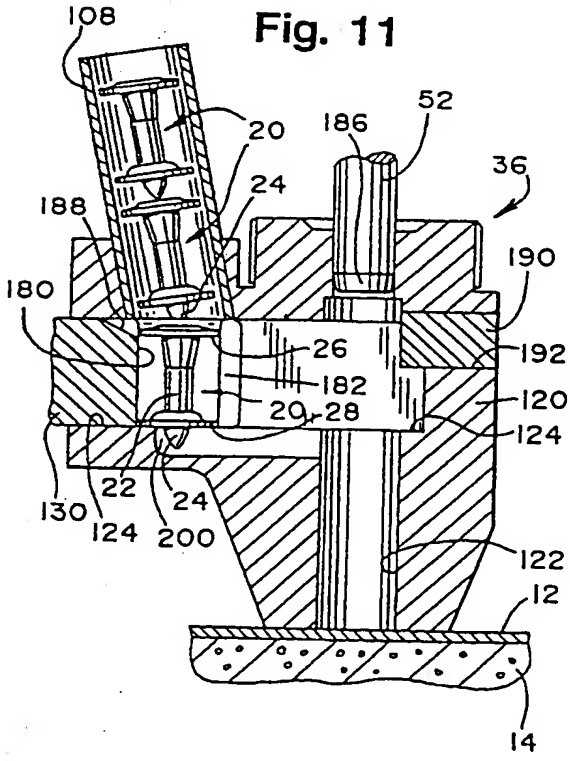


Fig. 13

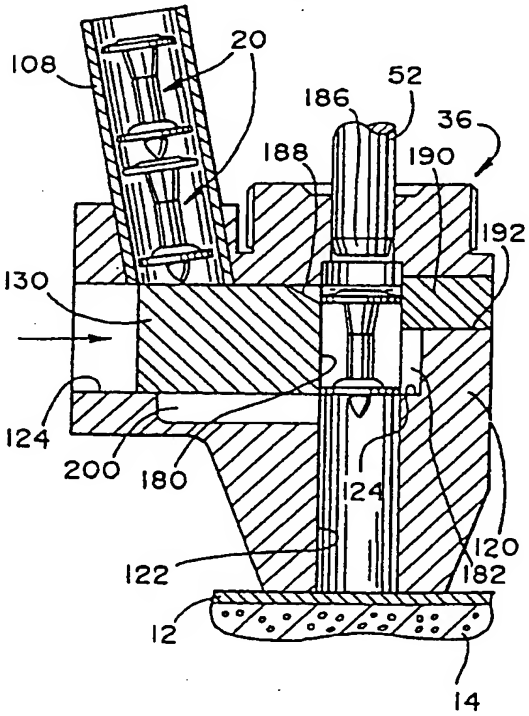


Fig. 14

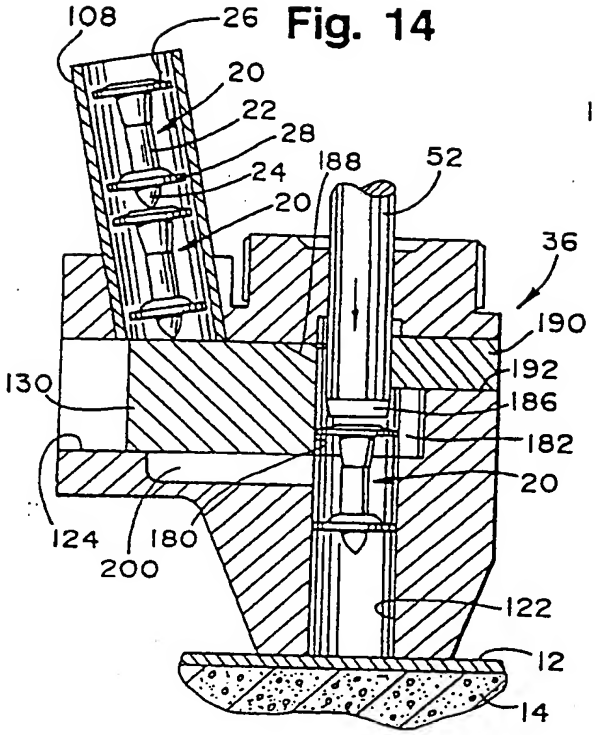
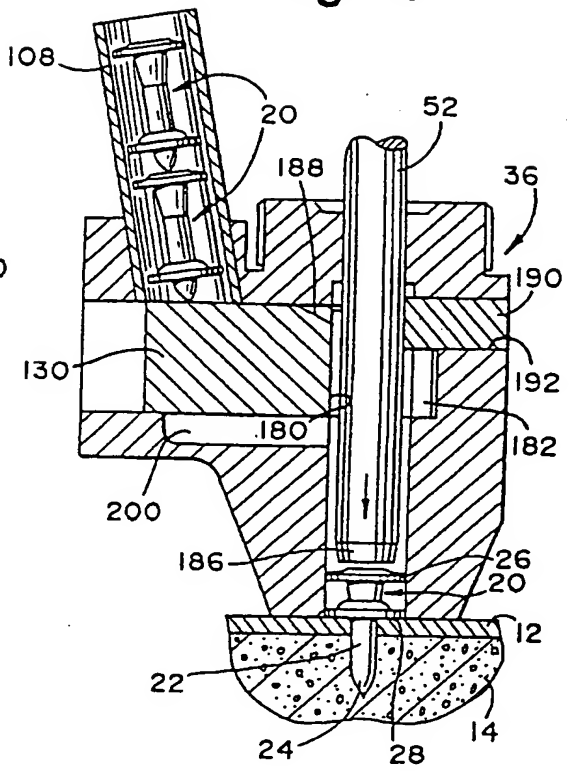


Fig. 15



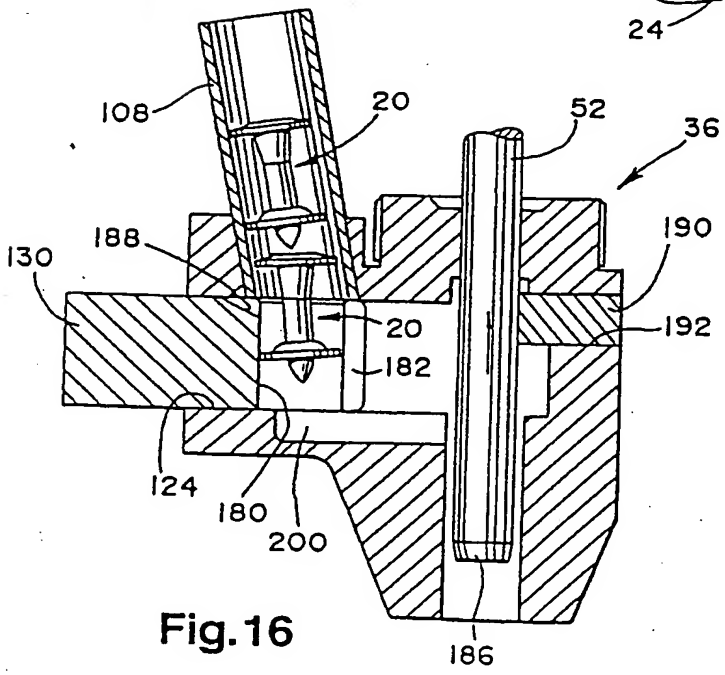


Fig.16

Fig.17

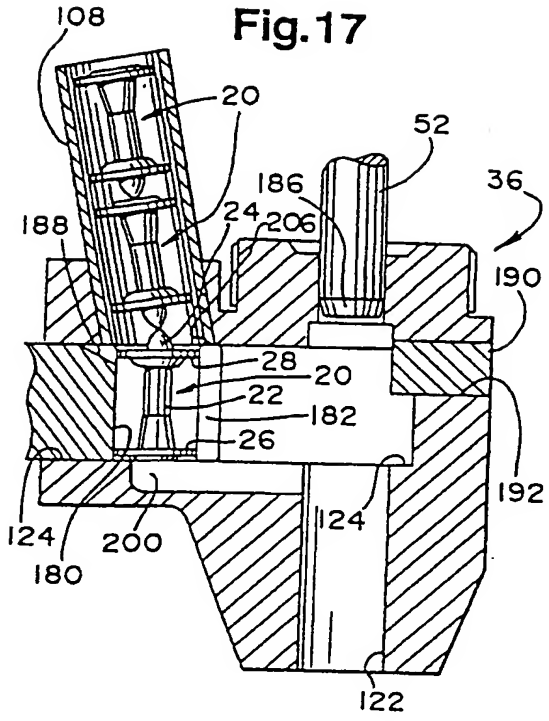
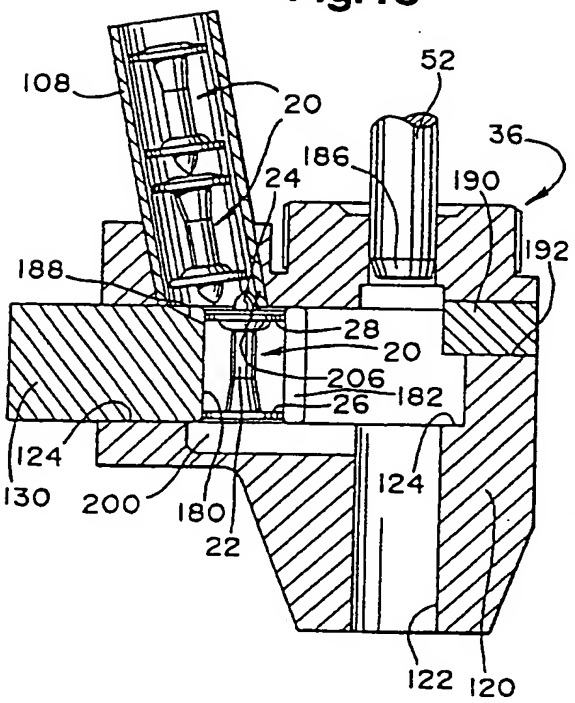


Fig.18



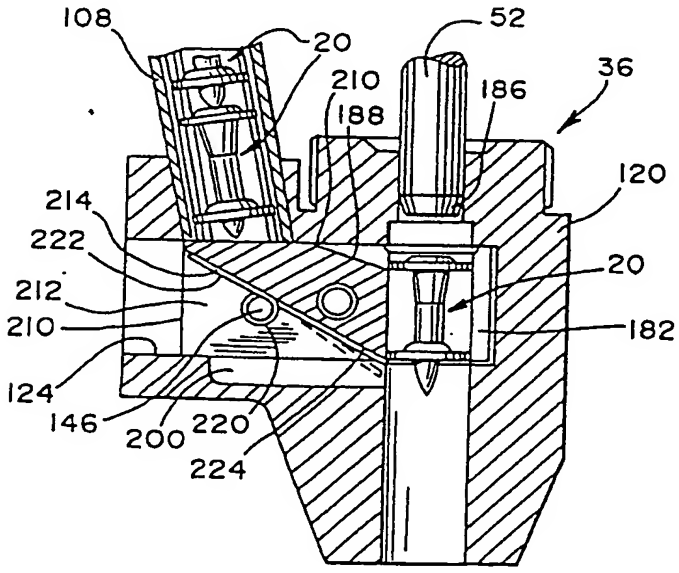


Fig.19